

# A Surgical Technique for Closure of 10 mm and Larger Laparoscopic Port Fascial Defects Using a Graham's Nerve Hook

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## ABSTRACT

**Background and Objectives:** In order to avoid potential complications from incisional hernias in patients undergoing laparoscopic or robotic procedures with 10 mm or larger ports, a surgeon closes the fascial defects using various techniques. We compared several different techniques of port site closure, which uses the open technique that can be performed with or without laparoscopic visualization. We modified the technique initially described by Dr. H. Aziz. We are introducing a new surgical technique to close the larger port site using Graham's nerve-hook. This new technique is easy to learn, replicate and implement for all body types.

**Methods:** We use the commonly available Graham's nerve-hook and two S-retractors to visualize the entire layers of fascia and peritoneum and to pull up both layers to close the larger port site safely and securely with 0 polyglactin absorbable suture. We illustrated this new Lee's port site closure technique with eight separate drawings in this paper.

**Results:** We performed 493 consecutive laparoscopic cases using this new technique. Four years follow up revealed only one incisional hernia using this technique.

The patients are routinely followed in one month and six months and a year after the operation. However, not all of the patients are seen after six months unless there was a specific complaint.

**Conclusion:** The new port site closure technique introduced in this paper is found to be easy to learn, fast, and very cost effective due to the reusable, commonly found S-retractors and Graham's nerve hook. After four years of consistent use, this new technique was found to be safe and effective in closure of 10 mm or larger port sites.

**Key Words:** Graham's nerve hook, Incisional hernias, Port fascial defects, S-retractors.

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Acknowledgements: The authors thank Heejoo Vallve for the excellent work in designing the medical illustrations.

Disclosure: none.

Conflict of interests: none.

Funding sources: none.

Informed consent: Dr. Francis Sangwon Lee declares that written informed consent was obtained from the patient/s for publication of this study/report and any accompanying images.

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DOI: 10.4293/JSLS.2023.00011

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## INTRODUCTION

There are three broad categories of port-closure techniques initially reported by Dr. Shaher.<sup>1</sup> He categorized three different groups of techniques this way: 1) "techniques that use assistance from inside abdomen (i.e., requiring two additional ports: one for the laparoscope and one for the grasper), 2) techniques that use extracorporeal assistance (i.e., needing only one additional port for the laparoscope), and 3) closure techniques that can be performed with or without (laparoscopic) visualization."<sup>1</sup> Dr. Ng in the letter to the editor of the same issue of *Surgical Endoscopy* proposed slightly different classification, "to avoid confusion caused by the overlap between the second and the third group, I would suggest that the last group be confined to those performed under direct vision without laparoscopic visualization."<sup>2</sup>

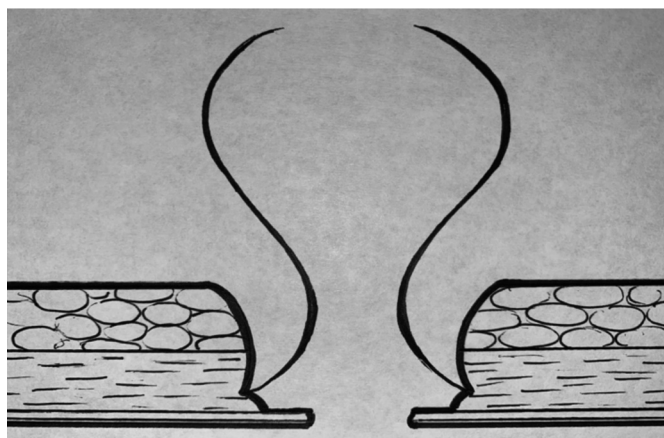
We, the authors of this article, have been comparing various established techniques in the third group since this group does not require laparoscope for internal visualization and continued insufflation.<sup>1-11</sup> We tried various simple open technique of laparoscopic port closure and found that the technique initially described by Dr. Homayara Haque Aziz in the *Journal of The Society of Laparoscopic & Robotic Surgeons* in 2013 using two S-retractors to be one of better and easier to implement.<sup>3</sup> However, the Aziz technique was a little too difficult to

perform in obese patients and also took some time to master. Therefore, we came up with a new technique using Graham's nerve hook to grasp the fascial opening under a direct visualization using S-retractors and safely perform the simple or figure-of-eight suture closure of the deep fascia and peritoneum to prevent any incisional hernia. This new technique has been used consistently for the past four years without an exception for different body sizes and no incisional hernias.

## METHODS

The key to the new technique of closing a fascial defect created by 10-mm or larger port sites in laparoscopic or robotic surgery is the usage of Graham's nerve hook—a blunt tipped metal nerve hook. The Graham's nerve hook comes in 7 inches of length and has a gentle curve at its end with a blunt tip. This feature is ideal in placing into the varying depth of an incision and gently hooking one side of the fascial opening with peritoneum and fascia while two S-retractors protect and guide the operating surgeon for easy visualization and identification of the fascial defect's anatomy. This method is easily duplicated with minimal training.

For those patients with large amount of subcutaneous fatty tissue, the visualization of the fascial defect can be challenging with only two thin S-retractors. Therefore, 1 cm or more enlargement of the skin incision to accommodate an Army-Navy retractor with two S-retractors to create a triangular retraction of the deep subcutaneous tissue can be a quite useful method. The fascial closure is easier if the intra-abdominal irrigation fluid does not flow out into the surgical field. Therefore, it is imperative that



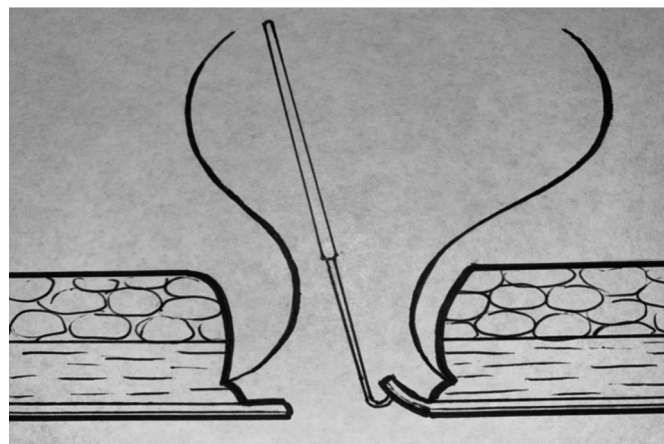
**Figure 1.** Ten-millimeter port site opening.

the operating surgeon makes sure that the intra-abdominal fluid from irrigation is completely suctioned out before the closure is attempted. By placing the patient's bed in a reverse Trendelenburg position, it can achieve the same effect. It is also helpful to keep the patient as relaxed as possible during the closure.

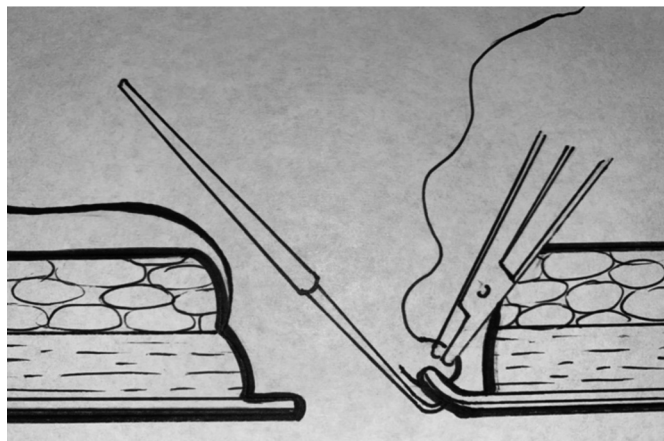
**Step 1:** First the 10-mm port site skin opening is maintained completely dry from blood or any other fluid from the inside of the patient. Then two S-retractors are placed into the port site, gently spreading the subcutaneous tissues on both sides exposing the fascial opening (**Figure 1**).

**Step 2:** After the proper identification of the fascial opening, the Graham's nerve hook is placed under the fascia into the opening to grasp the peritoneum and the fascia on the side of the surgeon and pull up. The assistant can lift the S-retractors to keep the fascia and peritoneum off of the intraperitoneal cavity to aid in visualizing and safely placing the Graham's nerve hook under the peritoneum and fascia without grasping any other organs such as the intestine (**Figure 2**).

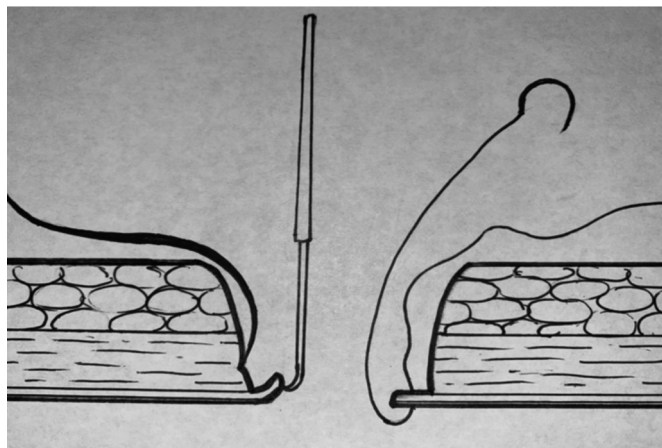
**Step 3:** The S-retractor on the surgeon's side should be pulled out to make enough space for the needle-holder with UR-6 needle and 0 Polyglactin Absorbable suture (0-Vicryl) to stitch the fascia and peritoneum of the surgeon's side. The needle should go through the fascia, muscle, and peritoneum in full thickness bite. We recommend at least a 1-cm width of the bite for secure closure. For 1-cm defect we recommend a simple stitch and for 1.5-cm defect a figure-of-eight stitch and 2-cm defect two simple stitches are adequate in safe closure (**Figure 3**).



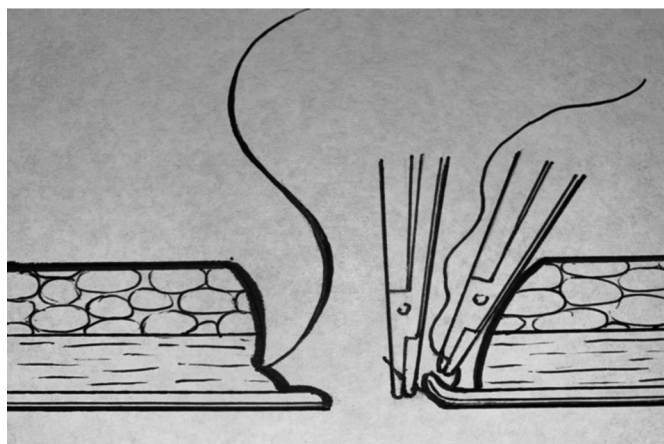
**Figure 2.** The Graham's nerve hook is placed under the fascia into the opening to grasp the peritoneum and the fascia on the side of the surgeon and pulled up.



**Figure 3.** The S-retractor on the surgeon's side is pulled out to make enough space for the needle-holder.



**Figure 5.** Repeat of the same procedure on the opposite side of the operating surgeon.

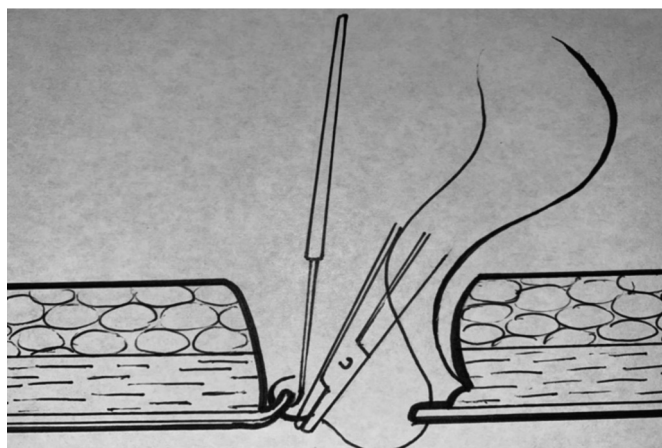


**Figure 4.** Assistant with another needle-holder grabs the needle tip from the surgeon's needle-holder.

Step 4: Assistant with another needle-holder grabs the needle tip from the surgeon's needle-holder. It is important that the first needle-holder does not release the needle until the second needle-holder firmly grasps the needle tip and pull it out of the surgical field (**Figure 4**).

Step 5: Next step is a repeat of the same procedure on the opposite side of the operating surgeon. Both S-retractors are once again placed into the subcutaneous tissue and gently pull apart the port site. Then the Graham's nerve hook is used to hook the opposite fascia and peritoneum (**Figure 5**).

Step 6: Then the S-retractor is pulled out as the Graham's nerve hook is used to pull up the fascia and peritoneum



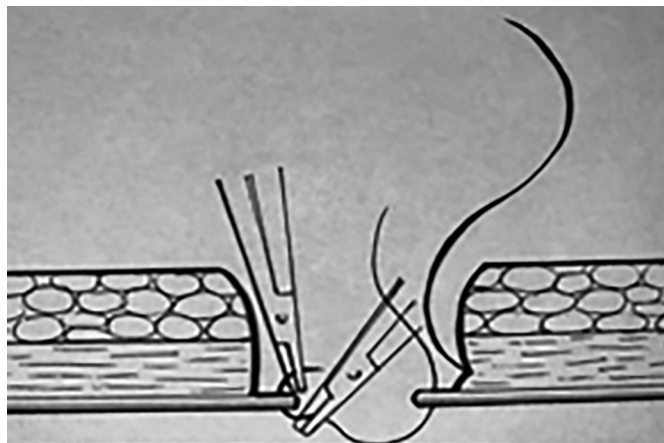
**Figure 6.** S-retractor is pulled out as the graham's nerve hook is used to pull up the fascia and peritoneum as the surgeon put the needle through the peritoneum and fascia.

as the surgeon put the needle through the peritoneum and fascia (**Figure 6**).

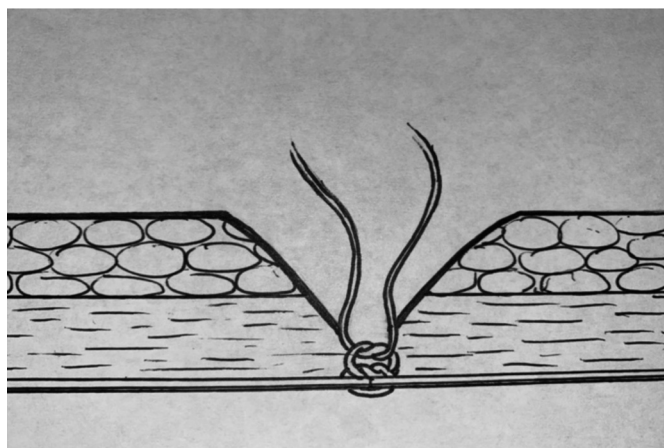
Step 7: The assistant with another needle-holder grasps the exposed needle tip and pulls out the needle as the operating surgeon releases the hold on the needle (**Figure 7**).

Step 8: Finally, the suture is tied over the peritoneum and fascia securely. It is up to the operating surgeon to determine whether a simple suture or figure-of-eight suture is necessary for secure closure of the fascial opening. If the figure-of-eight suture is necessary, repeat the steps 1 through 7 with the same suture to make a figure-of-eight suture (**Figure 8**).





**Figure 7.** Assistant grasps the exposed needle tip and pulls out the needle as the surgeon releases the hold on the needle.



**Figure 8.** Suture is tied over the peritoneum and fascia securely.

The most commonly available surgical tools that are used for this new technique are shown in **Figure 9**. The two S-retractors, needle-driver, a Graham's Nerve Hook, and forceps are reusable and can be resterilized for cost savings.

Since Feb 12, 2019, we have used the Graham's nerve hook method to close all of the 10-mm or larger port sites. As of May 30, 2023, we have performed this closure technique on 493 different laparoscopic operations and had only one incidence of port site hernia on a female patient who had a laparoscopic cholecystectomy and developed an incisional hernia at the 12-mm port site. The patients are routinely followed at 1 month, 6 months, and 1 year after the operation. However, not all of the patients are



**Figure 9.** Two S-retractors, needle-driver, a Graham's nerve hook, and forceps.

seen at 6 months or 1 year after their operations unless there was a specific complaint.

## DISCUSSION

The new port site closure technique described in this paper is used consistently for the past four years for most of the 10-mm or larger ports sites with very few exceptions. There are several technical details that need to be discussed. In order to achieve a successful outcome, the surgical field must be kept dry from the beginning of the suturing process to the end. In order to achieve this, an operating surgeon must make sure that there is absolutely no bleeding in the incision site, and that the irrigation fluid is completely suctioned out before stitching. One way to maintain a dry field of operation is to keep the patient in a slight reverse-Trendelenburg position in order to keep the internal irrigation fluid out of the surgical field in addition to meticulously maintaining a dry field of operation internally and externally. Once the peritoneum and fascia are hooked, it is helpful to lift the Graham's nerve hook straight upward to assist the surgeon in better visualization. For the patients with larger body size with thick subcutaneous fat, we have made the skin incision longer in order to put two S-retractors and a third Army-Navy retractor to create a triangulation for a better visualization. Upon the completion of the suturing of the fascial defect, we performed the final inspection using laparoscopy for the initial 100 patients. Now, after many consecutive visualizations of the completely secure closures of the port sites using this new technique, we now only perform the final laparoscopic inspection on the select few patients with higher than 30 body mass index or if the

visualization of the port site opening was inadequate. In order to prevent any potential injury to the bowel, the operating surgeon must visualize the peritoneum and fascia throughout the entire process as mentioned throughout this paper.

This new simple suturing technique of laparoscopic fascial defect using the Graham's nerve hook is easy to learn, safe to implement, highly reproducible, and cost effective. Compared to the technique previously described<sup>11</sup> using the single use of a sharp needle tip suture grasper, or using an expensive disposable needle tip guide, which take longer to learn the technique properly, take longer to perform, and are more costly. This new technique described in this paper is achieved with much shorter operating time and easily reproducible.

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